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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/620,728	07/16/2003	Yasuhiro Mizohata	P/ 2699-25	9065

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EXAMINER

WILKINS III, HARRY D

ART UNIT	PAPER NUMBER
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1742

DATE MAILED: 03/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/620,728

Applicant(s)

MIZOHATA ET AL.

Examiner

Harry D. Wilkins, III

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 February 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-38 is/are pending in the application.
- 4a) Of the above claim(s) 13-35 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-12 and 36-38 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date: _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Status

1. The rejection of claim 1 under 35 USC 102 as being anticipated by Starinshak et al has been withdrawn in view of Applicant's amendment to the scope of claim 1.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 5-8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The phrase "wherein the replacement liquid separates the copper supply source from the plating liquid" is not clear. Only by reading limitations from the specification (see pages 10-12 of the specification) can this claim limitation be interpreted to mean that the copper dissolution tank is emptied of liquid, while the plating liquid in the plating vessel remains in place, and a replacement liquid is filled into the copper dissolution tank. Examination of these claims will be based on the assumption that the intended scope of these claims is that disclosed on pages 10-12 of the specification.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 1, 3, 4, 9-12 and 36-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Starinshak et al (US 5,100,517).

Starinshak et al teach (see abstract and figure) a plating apparatus including a plating section (10) for performing a plating process with the use of a plating liquid for plating a substrate with copper, the plating section having an insoluble anode (15), a copper dissolution tank (20) connected to the plating section for communication of the plating liquid with the plating section and accommodating therein a copper supply source (24) and a first circulation mechanism for circulating the plating liquid through the plating section and the copper dissolution tank. Starinshak et al teach (see col. 5, lines 52-61) that the copper supply source (24) was in various geometric shapes, including wire.

Starinshak et al teach that the plating section included a single plating vessel. However, duplication of parts has been held to be obvious. See MPEP 2144.04.VI.B. In the present instance, it would have been obvious to have added additional plating vessels for the purpose of allowing multiple plating processes to have occurred simultaneously, thereby increasing overall efficiency.

Starinshak et al do not teach that the plating section included a plating liquid container capable of containing the plating liquid in a greater amount than the plating vessels and a second circulation mechanism for circulating the plating liquid through the plating vessels and the plating liquid container. The apparatus of Starinshak et al did include a plating vessel for containing the plating liquid to be brought into contact with the substrate.

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However, it would have been obvious to one of ordinary skill in the art to have added another storage reservoir intermediate the copper dissolution tank and the plating vessel in the apparatus of Starinshak et al because the duplication of parts has been held to be obvious. See MPEP 2144.04.VI.B. The motivation to add another reservoir would be to have ensured that the electrolyte being fed to the plating cell had had sufficient time and agitation to become well mixed prior to contacting the workpiece. Regarding the size limitation of the plating liquid container being larger than the total volume of the plurality of plating vessels, it would have been obvious to one of ordinary skill in the art to have sized the mixing reservoir to any appropriate size. See MPEP 2144.04.IV.A. Absent evidence of an unexpected result, the size of the reservoir is considered *prima facie* obvious.

Regarding claim 3, Starinshak et al do not teach that the copper supply source was a plurality of mesh members prepared by weaving a copper wire, where the mesh members were stacked one on another along a flow path of the plating liquid in the copper dissolution tank.

However, Starinshak et al do teach (see col. 5, lines 52-61) that the copper supply source (24) could be made in various geometric shapes.

Therefore, it would have been obvious to one of ordinary skill in the art to have made the copper supply source to be in any desired shape, such as a stack of mesh sheets. Changing the shape of the copper supply source was shown to be an obvious variation by the teachings of Starinshak et al.

Regarding claim 4, Starinshak et al do not teach that the copper dissolution tank included a cartridge accommodating the copper supply source. Starinshak et al do teach (see col. 5, lines 52-61) that the copper supply source (24) could be made in various geometric shapes and included a titanium basket (25). The copper dissolution tank included a plating liquid inlet port for introducing the plating liquid and a plating liquid outlet port for discharging the plating liquid.

However, it would have been obvious to one of ordinary skill in the art to have made the copper supply source to be in a removable cartridge in the copper dissolution tank because making a portion of a device separable has been held to be obvious. See MPEP 2144.04.V.C. The motivation to make the titanium basket of Starinshak et al removable (i.e.-formed as a cartridge) would have been in order to be able to easily replace the basket should fouling occur or when all of the copper had been consumed.

Regarding claim 9, Starinshak et al teach a single copper dissolution tank. However, it would have been obvious to one of ordinary skill in the art to have added a second copper dissolution tank so that while the titanium basket was being filled, the operation of the plating section could be carried out continuously without interruption. It would have been obvious to one of ordinary skill in the art to have used the weight of the titanium basket copper source to determine when the basket was empty, and to select the copper dissolution tank as necessary based on the weight (amount) of copper remaining in the basket.

Regarding claim 10, it would have been obvious to have used the copper supply source with the lowest weight first in order operate the device with a maximum of filled

baskets at any time. By using the lowest basket first, a majority of the baskets will remain filled, such that the cell could operate a longer amount of time without having to have human intervention to fill the baskets.

Regarding claim 11, Starinshak et al do teach (see col. 5, lines 52-61) that the copper supply source (24) could be made in various geometric shapes.

Therefore, it would have been obvious to one of ordinary skill in the art to have made the copper supply source to be in any desired shape, such as a stack of mesh sheets. Changing the shape of the copper supply source was shown to be an obvious variation by the teachings of Starinshak et al.

Regarding claim 12, Starinshak et al do not teach that the copper dissolution tank included a cartridge accommodating the copper supply source. Starinshak et al do teach (see col. 5, lines 52-61) that the copper supply source (24) could be made in various geometric shapes and included a titanium basket (25). The copper dissolution tank included a plating liquid inlet port for introducing the plating liquid and a plating liquid outlet port for discharging the plating liquid.

However, it would have been obvious to one of ordinary skill in the art to have made the copper supply source to be in a removable cartridge in the copper dissolution tank because making a portion of a device separable has been held to be obvious. See MPEP 2144.04.V.C. The motivation to make the titanium basket of Starinshak et al removable (i.e.-formed as a cartridge) would have been in order to be able to easily replace the basket should fouling occur or when all of the copper had been consumed.

Regarding claim 36, Starinshak et al do not teach that the plating section included a plating liquid container capable of containing the plating liquid in a greater amount than the plating vessel and a second circulation mechanism for circulating the plating liquid through the plating vessel and the plating liquid container. The apparatus of Starinshak et al did include a plating vessel for containing the plating liquid to be brought into contact with the substrate.

However, it would have been obvious to one of ordinary skill in the art to have added another storage reservoir intermediate the copper dissolution tank and the plating vessel in the apparatus of Starinshak et al because the duplication of parts has been held to be obvious. See MPEP 2144.04.VI.B. The motivation to add another reservoir would be to have ensured that the electrolyte being fed to the plating cell had had sufficient time and agitation to become well mixed prior to contacting the workpiece.

Regarding the limitations about the copper supply source, Applicant admits that such limitations are met by a plurality of pipes (203) such as can be seen in figures 17 and 18). Starinshak et al do teach (see col. 5, lines 52-61) that the copper supply source (24) could be made in various geometric shapes, and thus, it would have been obvious to one of ordinary skill in the art to have made the copper supply source to be pipes of copper.

Regarding claim 37, Starinshak et al do teach (see col. 5, lines 52-61) that the copper supply source (24) could be made in various geometric shapes, and thus, it would have been obvious to one of ordinary skill in the art to have made the copper

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supply source to be a pipe disposed generally parallel to the flow path of the plating liquid, and to include an inner pipe in addition to the outer pipe.

Regarding claim 38, Starinshak et al do teach (see col. 5, lines 52-61) that the copper supply source (24) could be made in various geometric shapes, including plates. For maximum contact, the plate would have been arranged so that its large surfaces were generally parallel to the flow path of the plating liquid.

6. Claims 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Starinshak et al (US 5,100,517) in view of Andricacos et al (US 5,352,350).

The teachings of Starinshak et al are described above.

Regarding claim 5, Starinshak et al do not teach (1) a replacement liquid supplying section for supplying a replacement liquid into the copper dissolution tank and (2) a control section which performs a control operation to circulate the plating liquid through the plating section and the copper dissolution tank when the plating process is performed in the plating section and to stop the circulation of the plating liquid and replace the plating liquid in the copper dissolution tank with the replacement liquid supplied from the replacement liquid supplying section after completion of the plating process in the plating section.

However, Andricacos et al teach (see col. 1, line 16 to col. 2, line 43) that plating liquids age with use and from time to time need to be completely dumped and a new bath fed to the system. Such a dumping a replacement process would have necessitated a replacement liquid supplying section for supplying a replacement liquid into the copper dissolution tank.

Therefore, it would have been obvious to one of ordinary skill in the art to have added a replacement liquid section as taught by Andricacos et al in order to replace the plating liquid when it had become aged, and unsuitable for continued use. It would have been obvious to one of ordinary skill in the art to have added a control section to control the replacement operation by stopping the circulation of the plating liquid and to replace the plating liquid in the copper dissolution tank.

Regarding the feature that the replacement liquid separates the copper supply source from the plating liquid, (1) this limitation is related to the manner of operation of the claimed structure and (2) the replacement liquid supplying section of Andricacos et al would have been capable of replacing only the solution which was present in the copper dissolution tank. See MPEP 2114. Applicant has provided no structural difference to distinguish this claim from the prior art.

Regarding claim 6, Starinshak et al teach (see figure and col. 7, lines 19-29) a water supplying section for supplying water liquid into the copper dissolution tank for maintaining the level of liquid in the system. It would have been obvious to one of ordinary skill in the art to have used this water feed to have rinsed the system when the first plating liquid is dumped to ensure that more of the impurities and byproducts that caused the aging of the plating bath were removed from the system.

Regarding claim 7, Starinshak et al do teach (see col. 5, lines 52-61) that the copper supply source (24) could be made in various geometric shapes. Therefore, it would have been obvious to one of ordinary skill in the art to have made the copper supply source to be in any desired shape, such as a stack of mesh sheets. Changing

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the shape of the copper supply source was shown to be an obvious variation by the teachings of Starinshak et al.

Regarding claim 8, Starinshak et al do not teach that the copper dissolution tank included a cartridge accommodating the copper supply source. Starinshak et al do teach (see col. 5, lines 52-61) that the copper supply source (24) could be made in various geometric shapes and included a titanium basket (25). The copper dissolution tank included a plating liquid inlet port for introducing the plating liquid and a plating liquid outlet port for discharging the plating liquid. However, it would have been obvious to one of ordinary skill in the art to have made the copper supply source to be in a removable cartridge in the copper dissolution tank because making a portion of a device separable has been held to be obvious. See MPEP 2144.04.V.C. The motivation to make the titanium basket of Starinshak et al removable (i.e.-formed as a cartridge) would have been in order to be able to easily replace the basket should fouling occur.

Response to Arguments

7. Applicant's arguments filed 13 February 2006 have been fully considered but they are not persuasive. Applicant has argued that:

- a. The prior art does not teach that the size of the plating liquid container is greater than the size of the plurality of plating vessels.

In response, absent evidence of unexpected results, the size of an element in an apparatus has been held to be *prima facie* obvious. See MPEP 2144.04.IV.A.

- b. The device of Andricacos et al did not operate to dump only the plating liquid present in the copper dissolution tank.

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In response, the device of Andricacos et al would have been capable of operating in the claimed fashion. The manner of operation of a claimed apparatus does not distinguish that claim over the prior art. See MPEP 2114.

- c. The prior art does not teach a weight measuring section for individually measuring weights of the copper dissolution tanks.

In response, the Examiner provided a motivation to add such a device to the apparatus of Starinshak et al. The motivation only relies on knowledge that one of ordinary skill in the art possessed prior to the present invention. As the dissolution process occurs, the copper in the dissolution tank was consumed. Various alternatives were possible for determining when to replace the copper in the dissolution tank, such as a visual inspection of the amount of copper remaining (as disclosed by Starinshak et al), the weight of the copper remaining in the tank (such as by the process disclosed by Wales et al (US 4,796,782)), the concentration of copper leaving the dissolution tank (a decrease in the concentration leaving the dissolution tank would indicate that there was insufficient copper present), calculating the amount of copper consumed based on the power consumption of the dissolution tank (by using Faraday's Law), etc. Utilizing a different means for determining when the copper dissolution tank needed to be replenished would have been obvious to one of ordinary skill in the art. Absent reasoning why such structure provided unexpected results, these claims are held to be *prima facie* obvious.

- d. The prior art does not teach the claimed shape of the copper anode.

In response, see MPEP 2144.04.IV.B. Changes in shape absent evidence of unexpected results in considered *prima facie* obvious. Applicant has failed to provide an unexpected result by using the claimed shape and Starinshak et al expressly teach that the copper anode was not particular to any geometric configuration.

e. The prior art does not teach that the copper supply source was oriented parallel to the flow path in the copper dissolution tank.

In response, a mere rearrangement of the relative orientation of parts is not considered to patentably distinguish apparatus claims. Further, the apparatus of Starinshak et al would have been capable of allowing flow through the copper anodes. By allowing the flow to go through the copper anodes, the copper anodes would have been arranged parallel to the flow path.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

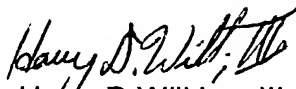
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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D. Wilkins, III whose telephone number is 571-272-1251. The examiner can normally be reached on M-F 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V. King can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Harry D Wilkins, III
Examiner
Art Unit 1742

hdw